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ABSTRACT: The results of experiments to determine the effect of irrigation on soil temperature are discussed.

The moisture content of the soil influences the soil's heat regime through /113* the higher specific heat of water, the heat expended on evaporation, and the changing capacity of the soil to conduct heat. The temperature of irrigation water usually is lower than the soil temperature, so it cools the top layer. Cherkasov [1] found that in Samarkand, irrigation reduced soil temperature from 55°C to 45°C. According to Cherkasov, the temperature of irrigated soil is more uniform; it is cooler in hot weather, and warmer in cold weather than non-irrigated soil. Randas and Dravid [2] measured soil temperatures at 1400 hours daily for six days. On the second day they irrigated one of the plots and found a sudden drop in soil temperature. Increase in the soil's moisture con- /114 tent influenced soil temperature so greatly that soil temperature in the irrigated plot was substantially lower, even four days after irrigation. According to Zakharov [3], the heat conducting capacity of the soil is influenced primarily by moisture content. According to his measurements, the heat conducting capacity of sand containing 9% moisture is six times that of absolutely dry sand. The moisture content can produce as much as a 1000% change in heat conductivity in other soils.

We repeatedly examined the soil-temperature modifying effect of irrigation at Martonvasar (in Hungary), on grasslands of medium impermeability, in September 1958 and 1959. We used thermistors of the 2TH type at depths of 2, 5, 10, and 20 cm, and made three measurements. The readings were taken in the observatory's laboratory 100 meters from the experimental plots every hour. In each case we used 24 thermistors, and two 20-conductor cables, 100 m long. We determined the soil's moisture content by the exsiccator method from three soil samples from each plot.

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* Numbers in the margin indicate pagination in the foreign text.

We used enough water in our first measurements (1958), to wet the 20 cm soil layer. On 15 September 1958, we irrigated a 2 x 2 meter plot that had been disked, harrowed, and rolled with 80 liters of water, equivalent to 20 mm of precipitation. We started measuring the temperature on the next day, when the direct cooling effect of the irrigating water had ceased. We took soil samples from the irrigated plot, and from a similarly cultivated, but nonirrigated, plot 5 m from the first. The sampling was repeated three times, samples being taken from 2, 5, 10, and 20 cm depths. Our tabulation gives the mean moisture content in the samples in terms of percentages of dry soil by weight. The non-irrigated plot was warmer at midday by 4-5°C at 2 cm, by 3-4°C at 5 cm, by 2°C at 10 cm, and 1°C at 20 cm than the irrigated plot. We examined the differences using the "t" test, and found them significant. We repeated our experiments several times in 1959, and during the fall season obtained results that were essentially the same as before; moist soil is cooler than dry soil.

TABLE

MOISTURE CONTENT OF DRY AND IRRIGATED SOILS IN PERCENTAGES OF DRY SOIL BY WEIGHT

a) On 16 September 1958:

	2	5	10	20 cm
dry soil	3.8	8.5	11.9	13.7%
irrigated soil	24.2	23.7	23.7	17.0%

b) Between 10-16 September 1959:

dry soil	2.5	4.7	12.8	13.6%
irrigated soil	17.0	14.9	12.8	13.7%

We measured plots irrigated by water equivalent to 5 mm of precipitation between 10-16 September 1959. This wet only the top 5 cm layer of the soil. Beneath that, even on the 5th day of examination, the moisture content was similar to that of the nonirrigated soil. We also show the mean moisture content of the soil for the five days. On each of the six days of examinations, the soil temperatures at noon were 3-4°C higher at the 2 and 5 cm depths of the dry plot than those measured for the irrigated plot. On the other hand, the irrigated plot was 2°C warmer throughout the day at 10 cm and 20 cm. The explanation of this is that irrigation increased the heat conductivity of the

top 5-cm soil layer, so that it conducted more heat to the deeper layers than did the dry soil, which had a poorer capacity to conduct heat.

REFERENCES

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3. Zakharov, Revut, Leontyev, Lyubovszkij, Docenkó, Novüj szposzob zakreplenyija pjeszkov [New Method of Soil Improvement], Moscow, 1954.

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